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WHAT IS CLAIMED:

1. Apparatus for premixing fuel and air to provide a fuel/air mixture, the apparatus comprising:

a mixing tube configured for receiving and mixing the fuel and air, the mixing tube having an entrance, an axis, and an exit for discharging a fuel/air mixture; and

a mixture valve associated with said mixing tube exit and including inner and outer valve members that together define an exit flow area;

wherein the defined exit flow area includes at least two segmented, substantially opposed, mixture flow-directing area portions with respect to angular position about the mixing tube axis; and

wherein at least one of said inner and outer valve members is movable relative to the other of said valve members to selectively vary the defined exit flow area with respect to time.

2. The premixer apparatus as in claim 1 wherein at least portions of said inner and outer valve members are formed from a ceramic material.

3. The premixer apparatus as in claim 1 wherein the inner valve member is a nozzle fixed to the mixing tube and the outer valve member is a skirt co-axially surrounding the nozzle with respect to the mixing tube axis and having a skirt end, wherein the skirt end and the nozzle define an exit flow area, and wherein said defined exit flow area and said mixture velocity vary with relative

positions of the skirt end and the nozzle during said relative movement therebetween.

4. The premixer apparatus as in claim 3 wherein said skirt is fixed and wherein said nozzle is movable, relative to the mixing tube entrance.

5. The premixer apparatus as in claim 3 wherein the nozzle includes one or more channels terminating in respective ports.

6. The premixer apparatus as in claim 3 wherein the nozzle is an asymmetric nozzle.

7. The premixer as in claim 1 wherein the inner valve member includes a valve plate;

wherein the outer valve member includes a skirt with an end contoured to provide said segmented area portions; and

wherein said flow area and said mixture velocity vary with relative positions of the valve plate and the skirt end during said relative movement therebetween.

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8. The premixer apparatus as in claim 5, wherein the skirt is fixed and the valve plate is movable, relative to the mixing tube entrance.

9. A gas turbine engine including the premixer apparatus as in claim 1.

10. Apparatus for combusting fuel and air comprising:

an annular combustion chamber having an axis;

at least one premixer configured to receive fuel and air;

wherein said premixer has a venturi for mixing the received fuel and air to form a fuel/air mixture and an exit in fluid communication with the combustion chamber for discharging the fuel/air mixture, the venturi having an axis;

wherein the premixer exit further includes inner and outer members defining an exit flow area, said exit flow area including area portions configured for channeling the fuel/air mixture in substantially opposed tangential directions relative to the chamber axis; and

wherein at least one of said inner and outer members is movable along said venturi axis relative to the other to selectively vary said defined exit flow area with respect to time, whereby a mixture discharge velocity can be varied.

11. The combustion apparatus as in claim 10, wherein said premixer includes a compressed air flow path between a compressed air source and said venturi, a fuel flow path between a fuel source and said venturi; and

wherein the combustion apparatus further includes an air valve and a fuel valve disposed in the respective flow paths for controlling the fuel/air ratio of said fuel/air mixture; and

wherein said mixture valve varies the exit velocity of the controlled fuel/air ratio discharged mixture.

12. The combustion apparatus as in claim 11 further including an air valve actuator operably connected to move said air valve;

a mixture valve actuator operatively connected to move said at least one movable member; and

a controller operatively connected to the air valve actuator and the mixture valve actuator.

13. Apparatus for combusting fuel with air, the apparatus comprising:

an annular combustion chamber having an axis;

at least one premixer configured to receive the fuel and air, the premixer further including

(1) means for mixing the received fuel and air to form a fuel/air mixture,

(2) exit means in fluid communication with the combustion chamber for distributing the fuel/air mixture to the combustion chamber; and

wherein said exit means further includes:

(i) means for defining an exit flow area, said exit flow area including area portions for channeling fuel/air mixture flow in substantially opposed tangential directions relative to the combustion chamber axis, and

(ii) means for selectively varying the defined exit flow area with respect to time.

14. The combustion apparatus in claim 13 further including means for sensing a parameter selected from the group consisting of torque, fuel flow, and power; and

control means responsive to said parameter sensing means for controlling said selectively varying means.

15. Apparatus for premixing fuel and air to provide a fuel/air mixture, the apparatus comprising:

a mixing tube configured for receiving and mixing the fuel and air, the mixing tube having an entrance, an axis, and an exit for discharging the fuel/air mixture;

a mixture valve associated with said mixing tube exit;

wherein said mixture valve includes coaxial inner and outer valve members having respective ends that define an exit flow area;

wherein at least the outer valve member end is contoured such that the defined exit flow area includes two opposed exit area portions with respect to angular position about the mixing tube axis; and

wherein at least said inner valve member is movable relative to the outer valve member to selectively vary the exit flow area with respect to time.

16. The premixer apparatus as in claim 15 wherein at least a portion of said inner valve member is formed from a ceramic material.

17. Apparatus for combusting fuel and air comprising:

an annular combustion chamber having an axis;

at least one premixer configured to receive fuel and air;

wherein said premixer has a venturi for mixing the received fuel and air to form a fuel/air mixture, the venturi having an axis;

wherein the premixer has an exit in fluid communication with the combustion chamber for discharging the fuel/air mixture;

wherein the premixer exit includes inner and outer members defining an exit flow area;

wherein at least said outer valve member is configured to define exit flow area portions positioned for directing the fuel/air mixture in substantially opposed tangential directions relative to the chamber axis, and

wherein at least said inner member is movable relative to the outer member to selectively vary said defined exit flow area with respect to time, whereby a mixture discharge velocity can be varied.

18. The combustion apparatus as in claim 17 wherein portions of said inner and said outer members are formed from a ceramic material.

19. A gas turbine engine having the combustor apparatus of claim 17.

20. A method for controlling the velocity and direction of a fuel/air mixture discharged from a premixer apparatus, the apparatus having a fuel/air mixing tube flow-connected to respective sources of fuel and compressed air, an axis, and an exit for discharging the fuel/air mixture, the method comprising:

providing a mixture valve associated with the exit including inner and outer valve members together defining an exit flow area;

channeling the discharged fuel/air mixture in at least two opposed directions relative to angular position about the axis using the mixture valve; and

moving at least one of the inner and outer valve members relative to the other to increase or decrease the exit flow area, whereby the channeled fuel/air mixture velocity is respectively decreased or increased.

21. The method as in claim 20 further including the steps of

sensing the pressure in the mixing tube upstream of the exit; and

controlling the position of said at least one of the inner and outer valve members relative to the other in accordance with the sensed pressure.

22. The method of claim 21 wherein the controlling step includes the step of controlling the position to either one of two preselected positions.

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23. A gas turbine gas generator operable with a fuel source, the gas generator comprising:

an air compressor;

a turbine;

a shaft assembly interconnecting the air compressor and the turbine;

and a combustor operatively connected to provide combustion gases to the turbine;

wherein the engine further includes one or more premixers each having

(1) a mixing tube configured for receiving and mixing the fuel and air, the mixing tube having an axis and an exit for discharging a fuel/air mixture; and

(2) a mixture valve associated with said mixing tube exit and including inner and outer valve members that define an exit flow area;

wherein the defined exit flow area includes at least two segmented, substantially opposed area portions with respect to angular position about the mixing tube axis;

wherein the segmented area portion includes ports for directing the discharged fuel/air mixture relative to the mixing tube axis; and

wherein at least one of said inner and outer valve members is movable relative to the other of said valve members to selectively vary the defined exit flow area with respect to time.

24. The gas turbine gas generator as in claim 23 further comprising:

a compressed air path interconnecting the compressor and each mixing tube;

a fuel path interconnecting the source of fuel and each mixing tube;

an air valve positioned in the compressed air path, and

a fuel valve positioned in the fuel path,

wherein the air valve and fuel valve are operable to control a fuel/air ratio of the mixture discharged from said mixing tube through said mixture valve.

25. The gas turbine gas generator as in claim 24,

wherein the gas turbine gas generator is a radial turbine gas generator having an annular combustor surrounding the turbine and the turbine having an axis;

wherein the generator has

(1) two or more of said premixers spaced circumferentially about said turbine axis with respective mixing tube axes inclined with respect to said turbine axis,

(2) a single air valve, and

(3) a compressed air distribution manifold interconnecting the single air valve and the

entrances of each of the mixing tubes of said premixers;

wherein the radial turbine has an exhaust cone; and

wherein the distribution manifold is disposed in an annular space surrounding the exhaust cone.

26. The gas turbine gas generator as in claim 23,

wherein the gas turbine gas generator is a radial turbine gas generator having an annular combustor surrounding the turbine and the turbine having an axis;

wherein the generator has

(1) a single one of said premixers disposed at one angular position relative to the turbine axis,

(2) a compressed air path interconnecting the air compressor and the mixing tube,

(3) a single air valve disposed in said compressed air path at a second angular position relative to the turbine axis spaced substantially 180° from the one angular position; and

wherein a portion of the compressed air path between said one air valve and the premixer mixing tube entrance includes at least one manifold extending in a circumferential direction relative to the turbine axis.

~~27. A gas turbine engine having the gas generator as in claim 23.~~